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Potamogeton in New York

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POTAMOGETON

in New York

by

EUGENE C. OGDEN, State Botanist

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Perennial aquatic herbs from seeds, winter buds, or rhizomes. Stems simple or branched, terete or compressed, 0.1-5 mm in diameter; nodes sometimes with a pair of glands; internal anatomy of internodes variable but mostly uniform for each species. Leaves alternate, except opposite or subopposite at nodes with a peduncle, all submersed or with both submersed and floating blades. Submersed leaves flaccid, sessile, or petioléd, blades linear to ovate, apex acute or obtuse, entire to dentate, sometimes with 1 or more rows of translucent cells (lacunae) each side of midrib; stipules fused to form a single structure with 2 midveins arising from the axil of the stem and leaf, free or adnate to the leaf base, mostly sheathing the stem and sometimes with the outer margins partially fused (connate). Floating leaves coriaceous, petioled, elliptic to ovate; stipules like those of submersed leaves but never adnate nor connate. Inflorescence a spike, sessile, or on a peduncle to 60 cm long, with 1-20 whorls of flowers, capitate, cylindric, or moniliform, with 2-4 flowers in each whorl. Flowers with rounded, short-clawed, greenish sepals, 1-3 mm long; stamens 4, anthers sessile on the sepal claws, 2-celled, extrorse; pollen spherical, inaperturate; carpels 4, free, sessile. Fruits a dryish drupelet (appearing to be an achene on herbarium sheets) with spongy mesocarp and bony endocarp, the latter tissue projecting as a fold (endocarp loop) into the center of the fruit, 1-seeded; embryo coiled, endosperm absent. Winter buds (shortened and hardened tips of branches with crowded leaf blades and stipules) are produced in some species. Chromosomes: $2n = 26, 28, 52, 78, \text{ or } 104$. There is evidence to indicate that each "flower" may be an inflorescence composed of 1 pistillate and 4 staminate flowers.

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Key to Species

1. Leaves all submersed, linear, auricled at base, margins finely denticulate; stipules adnate 4. *P. robbinsii*
1. Leaves various, but if linear then not auricled
 2. Stipules adnate to the base of the leaf for a distance of 10 mm or more; floating leaves absent
 3. Leaves acute and sharp pointed at apex; fruits 2.5-4 mm long, with a short beak 3. *P. pectinatus*
 3. Leaves obtuse and blunt at apex, or sometimes minutely apiculate; fruits 2-3 mm long, beakless
 4. Primary stems 1-3 mm in diam; lower leaves with blades 1-2 mm wide and with loose inflated sheaths; upper leaves from the branches filiform; spikes with 5-12 whorls of flowers 2. *P. vaginatus*
 4. Stems 0.5-1 mm in diam; all leaves filiform, 0.2-0.5 mm wide; sheaths tight; spikes with 2-5 whorls of flowers 1. *P. filiformis*
 2. Stipules free or adnate for a distance of less than 10 mm; floating leaves present or absent
 5. Leaf margins serrate 5. *P. crispus*
 5. Leaf margins entire
 6. Leaves linear, veins 15-35 7. *P. zosteriformis*
 6. Leaf shape various but, if linear then with less than 15 veins
 7. Submersed leaves linear, less than 10 mm wide, length more than 20 times the width
 8. Submersed leaves ribbonlike, flaccid, 2-10 mm wide, with a prominent, parallel-sided median band of lacunae filling the broad space between the inner veins; fruits (not formed unless floating leaves are present) 2.5-4 mm long, embryo coil more than a complete revolution 17. *P. epihydrus*
 8. Submersed leaves 0.1-4 mm wide, lacunae not forming a prominent parallel-sided band; fruits 0.8-3 mm long, embryo coil less than 1 revolution or, if more, then fruits less than 2.5 mm long
 9. Stipules of some or all of the submersed leaves adnate to base of leaf blade; embryo coil more than a complete revolution
 10. Submersed leaves obtuse, usually rounded at apex, space between midrib and lateral veins commonly with lacunae; sheath of stipule longer than the free tip; emersed peduncles 0.5-3 cm long; fruits 1.3-2.2 mm in diam, with lateral keels rounded or absent 15. *P. spirillus*
 10. Submersed leaves subobtuse to acute or setaceous, lacunae absent or nearly so; sheath of stipule shorter than the free tip; emersed peduncles 0.2-1.5 cm long; fruits 0.8-1.5 mm in diam, with lateral keels tiny but evident 16. *P. diversifolius*
 9. Stipules free from the leaf blade; embryo coil less than a complete revolution
 11. Floating leaves present, more than 10 mm wide, with (7-) 9-37 veins

12. Floating leaf blades 2.5-6 cm wide, usually cordate; submersed leaves (usually absent at maturity) mostly from the main stem, 0.8-2 mm wide; fruits 3.5-5 mm long, keels obscure, coat wrinkled; apex of embryo pointing toward basal end 22. *P. natans*
12. Floating leaf blades 1-3 cm wide, rounded or cuneate at base; submersed leaves (usually present) mostly from branches, 0.2-1 mm wide; fruits 2.5-3.5 mm long, keels prominent, coat smooth; apex of embryo pointing a little above the basal end . . . 23. *P. oakesianus*
11. Floating leaves absent or, if present, mostly less than 10 mm wide, with 5-15 veins
 13. Leaves all submersed, flaccid, setaceous, 0.1-0.5 mm wide, 10-80 cm long, tapering to a delicate apex; peduncle 1 (rarely 2) from tip of primary stem, 1.5-24 cm long; fruits 2.2-3 mm long 6. *P. confervoides*
 13. Submersed leaves mostly more than 0.5 mm wide (except *P. vaseyi*, which has floating leaves and with submersed leaves less than 10 cm long); peduncles often more than 1 per stem
 14. Floating leaves usually present; submersed leaves 0.1-0.5 mm wide, tapering to a sharp pointed apex 14. *P. vaseyi*
 14. Floating leaves absent; submersed leaves (0.3-) 0.5-4 mm wide
 15. Leaves (at least some of them) with bristle tips; peduncles 5-15 mm long; spikes capitate, with 1-4 flowers 12. *P. hillii*
 15. Leaves obtuse or acute but not ending in a bristle
 16. Stipules strongly fibrous, becoming whitish, especially on the winter buds
 17. Leaves thin, 1.5-3.5 mm wide, with 5-7 veins, obtuse or rounded at apex; winter buds fan-shaped; peduncles flattened 9. *P. friesii*
 17. Leaves firm, 0.5-2.5 mm wide, with 3-5 veins, acute; winter buds slender; peduncles terete . . . 10. *P. strictifolius*
 16. Stipules delicate, greenish or brownish
 18. Leaves 2-4 mm wide, rounded at apex; fruits 3-4 mm long; winter buds 20-40 mm long, 3.5-7 mm wide 13. *P. obtusifolius*
 18. Leaves 0.3-3 mm wide, acute to obtuse (if rounded, then with a sharp mucro); fruits 1.8-2.8 mm long; winter buds 7-18 mm long, 0.5-2.5 mm wide
 19. Fruits with dorsal keel thin, undulate or dentate; leaves acute 8. *P. foliosus*
 19. Fruits with dorsal keel rounded; leaves acute or obtuse 11. *P. pusillus*
7. Submersed leaves without parallel sides, 2-70 mm wide (sometimes linear in *P. gramineus*), length less than 20 times the width
20. Submersed leaves petioled or sessile but not clasping; floating leaves often present
21. Submersed leaves sessile, apex obtuse; floating leaves delicate, blade tapering without sharp distinction into the petiole; fruit wall hard and smooth, tawny-olive 18. *P. alpinus*
21. Submersed leaves sessile or petioled, apex obtuse or acute; floating leaves coriaceous, blade distinct from petiole; fruit wall spongy, greenish, brownish, or reddish
22. Submersed leaves with 11-37 veins, margins without denticles; floating leaf blades cuneate to cordate at base, with 19-51 veins

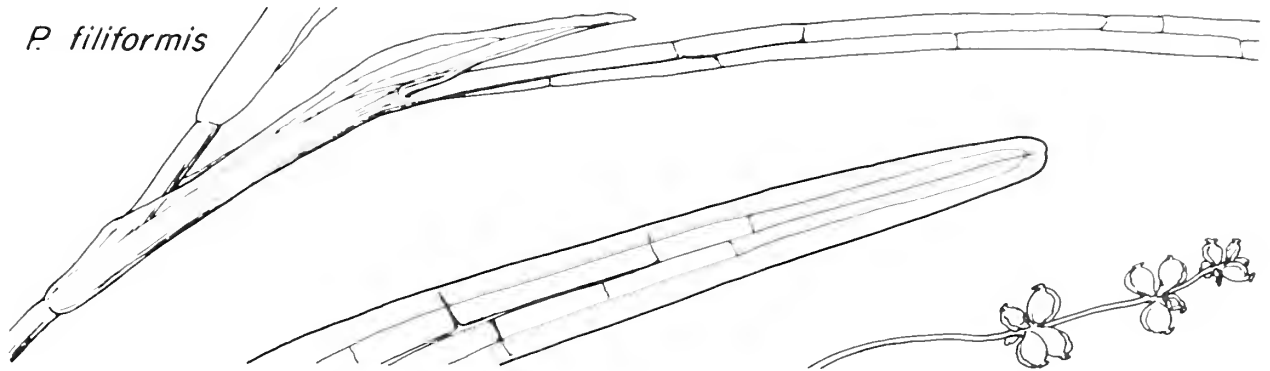
- 23. Submersed leaves usually arcuate, more than 25 mm wide, veins 19–37; stem not black spotted; floating leaf blades cuneate or rounded at base, veins mostly more than 30; fruits 3.5–4.5 (–5) mm long, cuneate at base 19. *P. amplifolius*
 - 23. Submersed leaves not arcuate, usually less than 25 mm wide, veins 9–21; stem usually black spotted; floating leaf blades cordate or rounded at base, veins mostly less than 30; fruits 3–3.5 (–4) mm long, rounded or lobed at base 20. *P. pulcher*
 - 22. Submersed leaves with 7–19 veins, margins with fugaceous 1-celled denticles; floating leaf blades tapering or rounded at base with 9–29 veins
 - 24. Submersed leaves with petioles 4–13 cm long, apex acutish but not sharp pointed; fruits 3.5–4 mm long, usually reddish, seldom developed unless floating leaves are present 21. *P. nodosus*
 - 24. Submersed leaves sessile or with petioles to 4 cm long, apex acutish or sharp pointed, sometimes rounded but with a mucronate tip; fruits 1.7–3.5 mm long, usually greenish
 - 25. Stem usually much branched, 0.5–1 mm in diam; submersed leaves 0.2–1.5 cm wide, sessile, with 3–9 veins; floating leaf petioles mostly longer than the blades; fruiting spikes 1–2.5 cm long; fruits 1.7–2.8 mm long 24. *P. gramineus*
 - 25. Stem simple or once branched, mostly 1.5–5 mm in diam; submersed leaves 1.5–4 cm wide, sessile or petioled, with 9–17 veins; floating leaf petioles mostly shorter than the blades; fruiting spikes 2.5–6 cm long; fruits 2.5–3.5 mm long 25. *P. illinoensis*
 - 20. Leaves all submersed, cordate or rounded at base and clasping the stem
 - 26. Leaves ovate-oblong, mostly 10–20 cm long, apex cucullate; stipules persistent and conspicuous; stem often whitish; peduncles mostly 15–60 cm long; fruits more than 4 mm long, dorsal keel strongly developed 26. *P. praelongus*
 - 26. Leaves roundish, ovate, or elongate-ovate, 1–10 cm long, apex not cucullate; stipules at maturity inconspicuous or disintegrated to fibers; stem greenish; peduncles 1–25 cm long; fruits less than 3.5 mm long, dorsal keel weakly developed
 - 27. Stipules coarse, disintegrating to persistent whitish fibers; peduncles clavate, 1.5–25 cm long; fruits with a cavity in the endocarp loop 27. *P. richardsonii*
 - 27. Stipules delicate, disappearing with age; peduncles not clavate, 1–9 cm long; fruits without a cavity in the endocarp loop 28. *P. perfoliatus*
-

1. ***P. filiformis*** Persoon

Occasional. Calcareous or brackish, mostly shallow water of lakes and streams.

Ours is var. **borealis** (Raf.) St. John

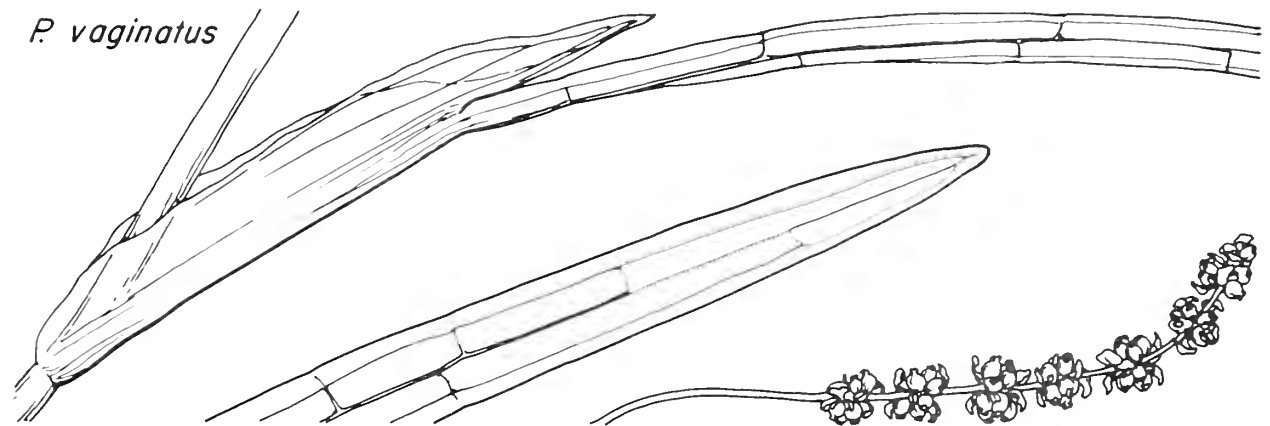
Recognized by the adnate, slender stipular sheaths and obtuse leaf tips.



2. ***P. vaginatus*** Turcz.

Rare. Calcareous or brackish water of lakes and streams.

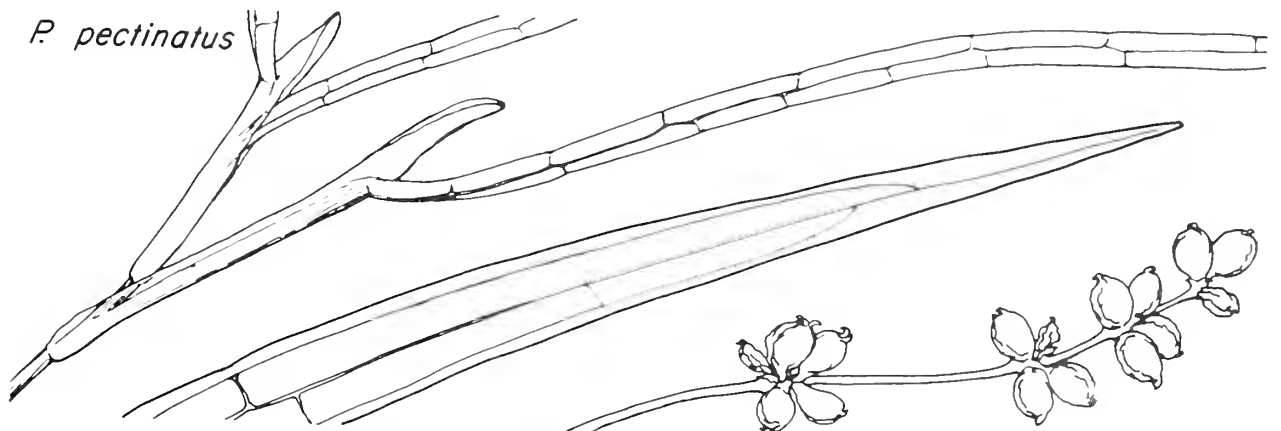
Recognized by the adnate broad stipular sheaths and obtuse leaf tips. Upper sterile branches difficult to distinguish from *P. filiformis*.



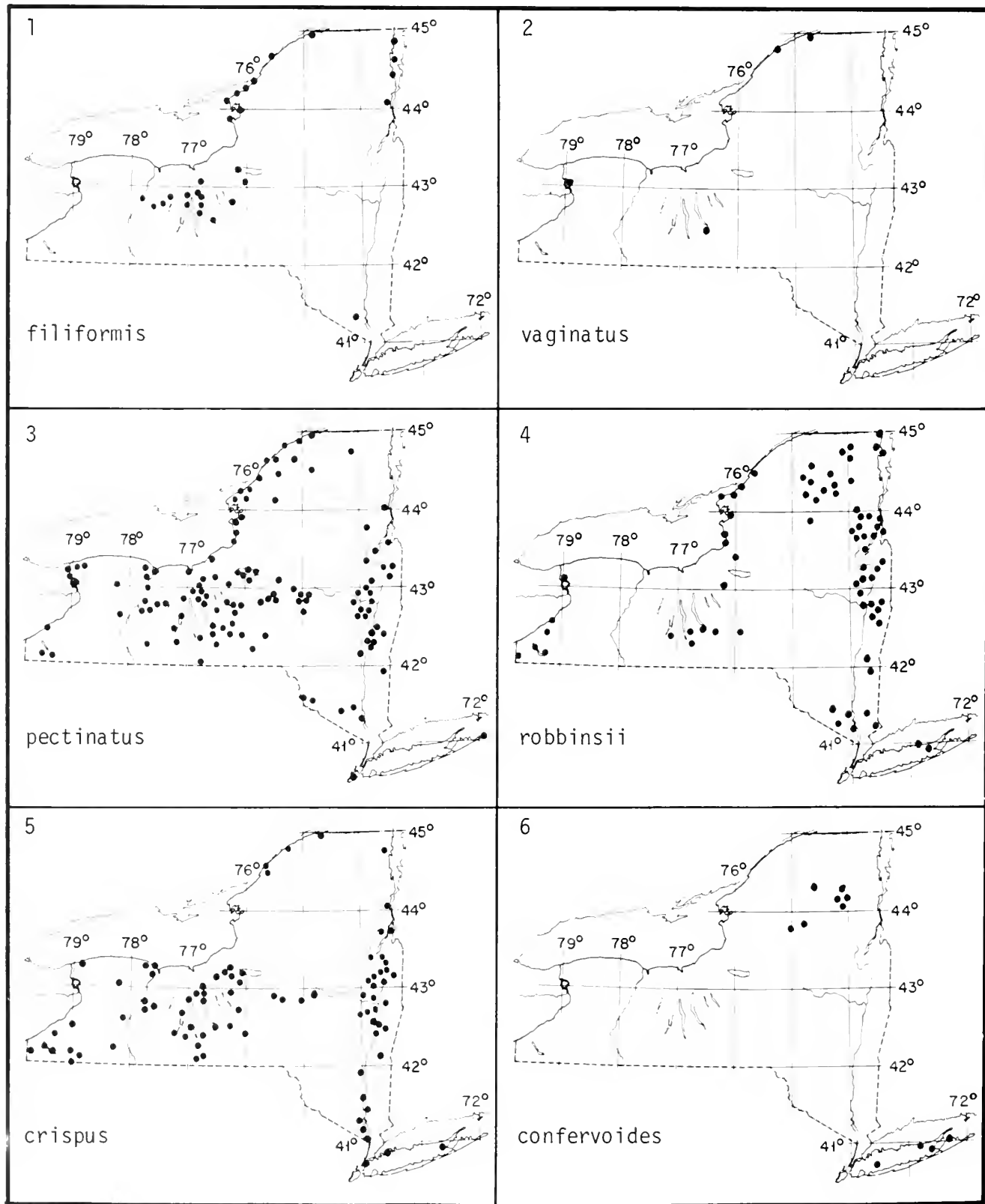
3. ***P. pectinatus*** L.

Common. Alkaline or saline water.

Recognized by the adnate, slender stipular sheaths and acute to sharp pointed leaf tips.



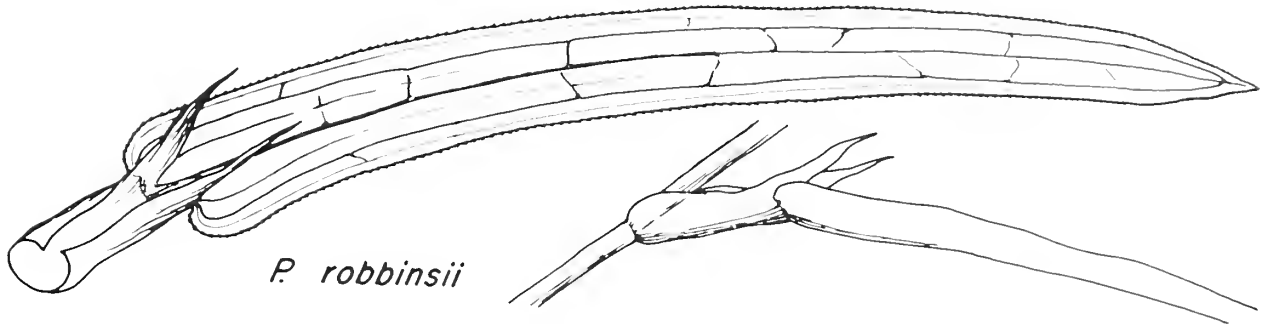
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4. *P. robbinsii* Oakes

Occasional to common; sometimes locally abundant and weedy.

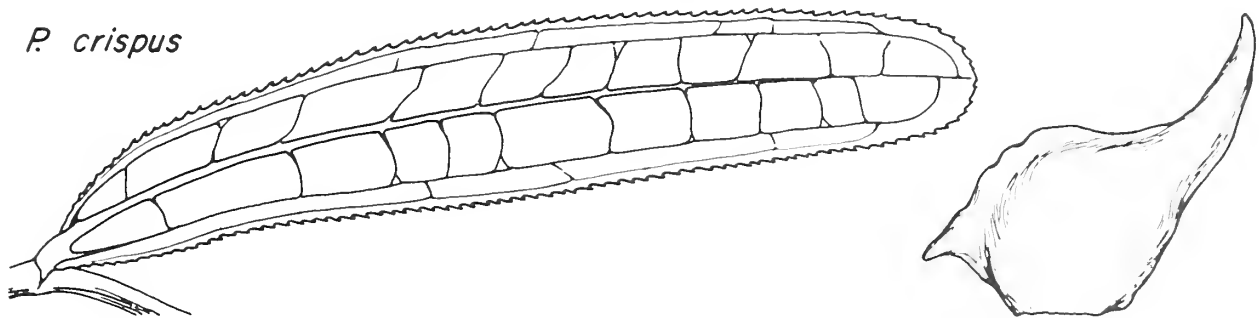
Recognized by the leaves which are auriculate at base, and by the finely serrulate leaf margins. Also, by the whitish adnate stipular sheaths and acute leaf tips. The leaves are usually stiffly 2-ranked, giving the branches a feathery appearance in the water. Often abundant and weedy but rarely found with fruit. A taxon with entire leaf margins (forma *cultellatus* Fassett) has not been found in New York.



5. *P. crispus* L.

Not native, but now widespread and often an abundant weed. Pools, lakes, and streams.

Our only species with dentate leaf margins.



6. *P. confervoides* Reichenb.

Uncommon. Bog pools and acid lakes.

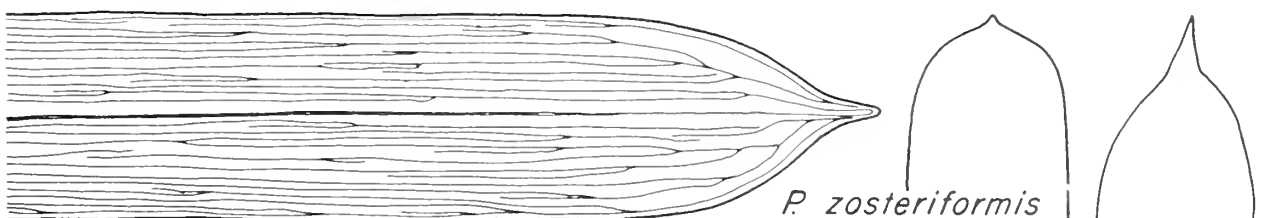
Usually recognized by the slender, delicate, grass-green leaves that gradually taper to a slender apex. The primary branches are much branched, giving a fan-shaped appearance in the water.



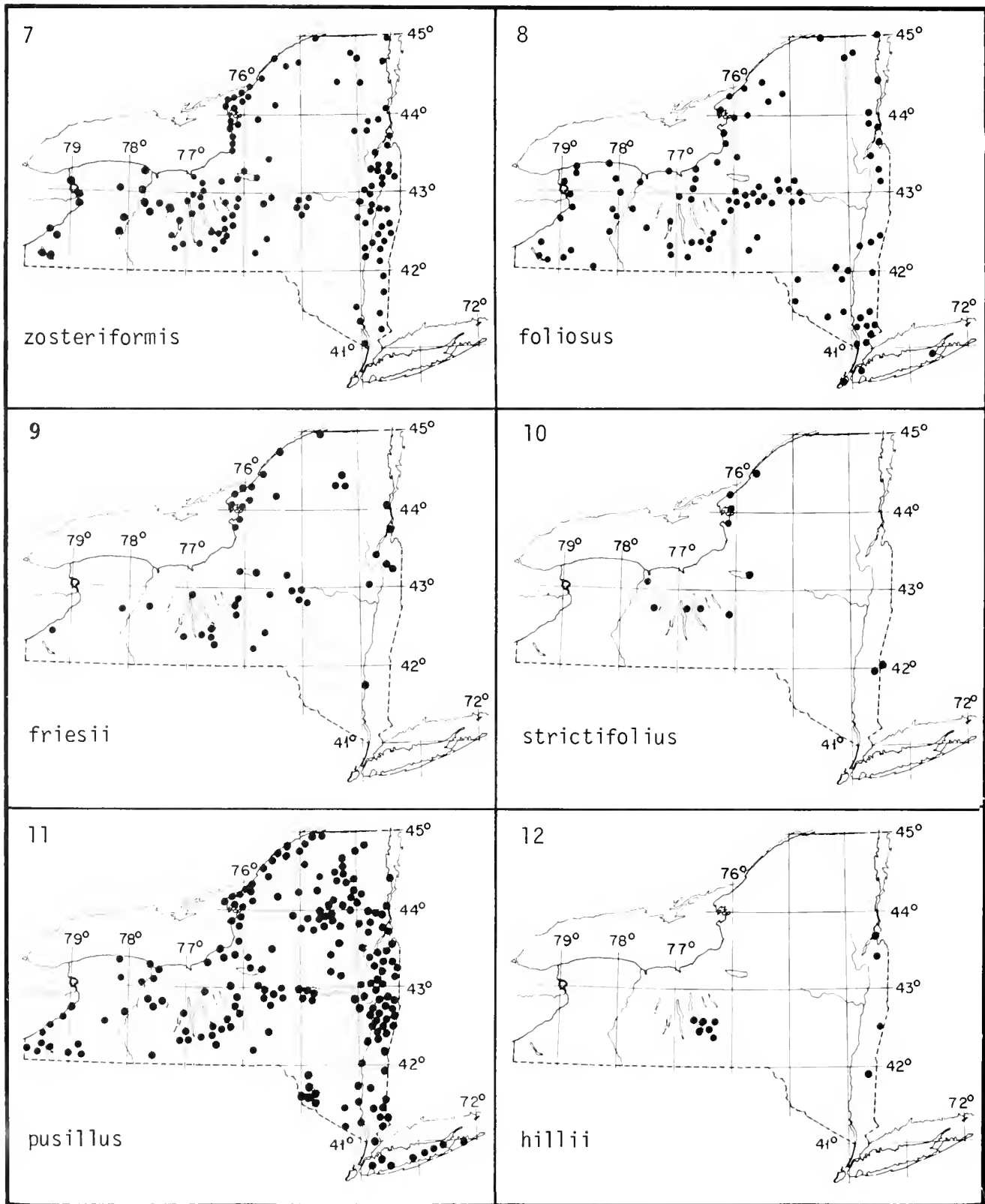
7. *P. zosteriformis* Fernald

Common. Lakes and quiet streams.

Easily recognized by the laterally flattened stem and linear leaves with 15 or more veins.



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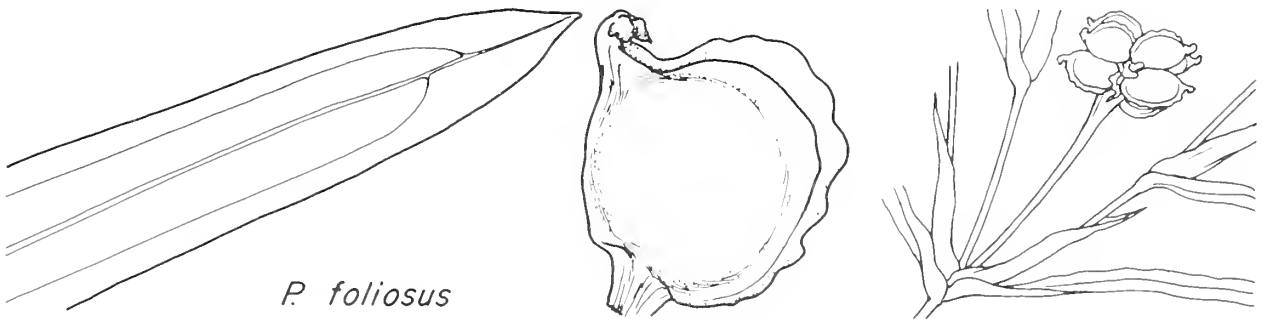
8. *P. foliosus* Raf.

Frequent. Fresh or brackish water of lakes and streams.

Sterile specimens are difficult to distinguish from *P. pusillus*. With mature fruit there is no question, it being the only species in the State bearing fruit with a thin, winglike dorsal keel and the embryo coil with no more than 1 revolution. The leaves are usually less lacinate and the apex never obtuse, as may occur in the variable *P. pusillus*. Also, the stems are oval to flattened in cross section, in contrast to the terete stems of *P. pusillus*.

Two intergrading varieties, which differ only in size, have been recognized: var. **foliosus** and var. **macellus** Fernald.

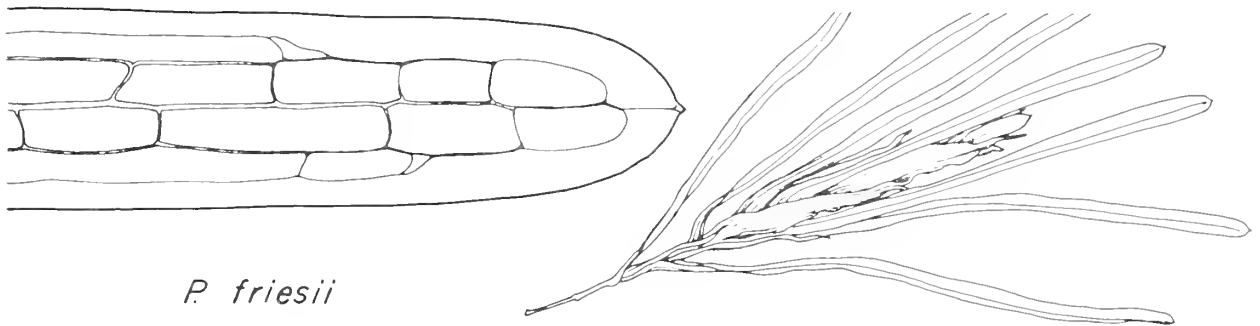
- 1. Stems loosely branched; leaves 1.4-2.7 mm wide, with 3-5 veins; stipules 7-18 mm long var. *foliosus*
- 1. Stems bushy-branched; leaves 0.3-1.5 mm wide, with 1-3 veins; stipules 3-11 mm long var. *macellus*



9. *P. friesii* Rupr.

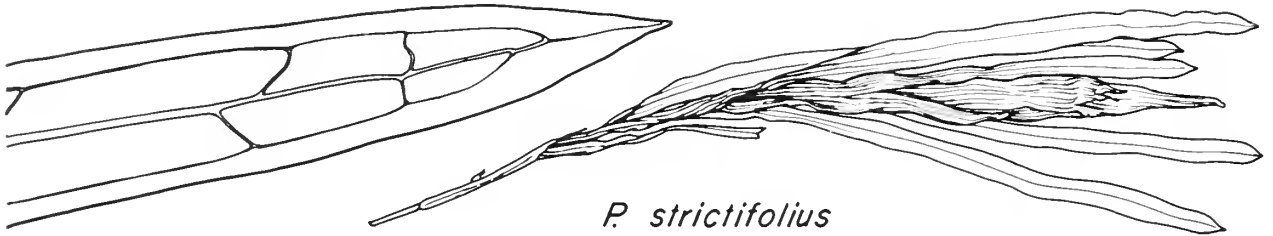
Frequent. Calcareous or brackish water of lakes and streams.

Similar to *P. strictifolius*. These species are usually distinguished from the other linear-leaved species by the firm, fibrous, whitish stipules.



10. *P. strictifolius* Benn.

Frequent. Calcareous water of lakes and streams.
Similar to *P. friesii*. See above.



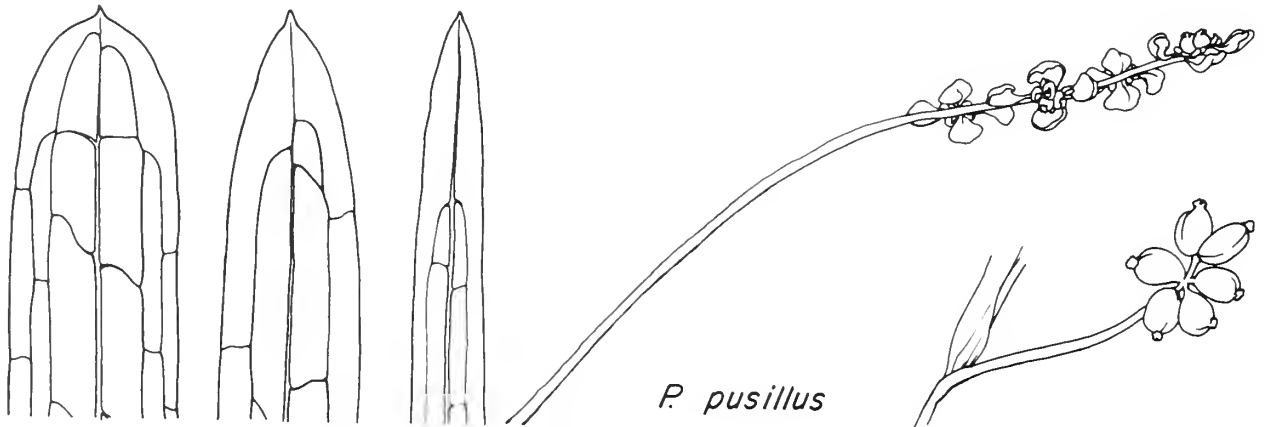
11. *P. pusillus* L.

Common and often abundant. Fresh or brackish water of lakes and slow streams.
Sterile material is similar to *P. foliosus*; see discussion under that species.

A highly variable species. We have two varieties which are treated as two species by many authors: var. **pusillus** and var. **tenuissimus** M. & K. (= *P. berchtoldii*, *P. b.* var. *tenuissimus*, *P. b.* var. *acuminatus*, *P. b.* var. *lacunatus*, *P. b.* var. *polyphyllus*).

1. Peduncles 1.5-8 cm long; spikes with 3-5 whorls of flowers, the whorls usually separated in fruit; leaves without lacunae along midrib or with a single row each side at base var. *pusillus*

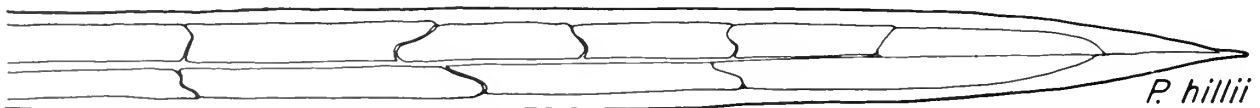
1. Peduncles 0.3-3(-4.5) cm long; spikes with 1-3 contiguous whorls; leaves with one or more rows of lacunae each side of midrib var. *tenuissimus*



12. *P. hillii* Morong

Rare, but may be locally abundant. Pools (often stagnant) and slow streams.

Our only species with leaves more than 1 mm wide that have only 3 veins and a bristle-tipped apex. The rare hybrid *P. × longiligulatus* also has bristle-tipped leaves but with more veins; it is mostly sterile. *P. hillii* fruits freely. The mucro at the leaf tip of *P. zosteriformis* sometimes appears like a short bristle.



13. *P. obtusifolius* M. & K.

Not common. Ponds and streams.

Generally distinguished from the other linear-leaved species by the leaves that are 2-4 mm wide and rounded at apex. Superficially similar to *P. friesii*, from which it differs by leaves with only 3 prominent veins and with nonfibrous stipules.

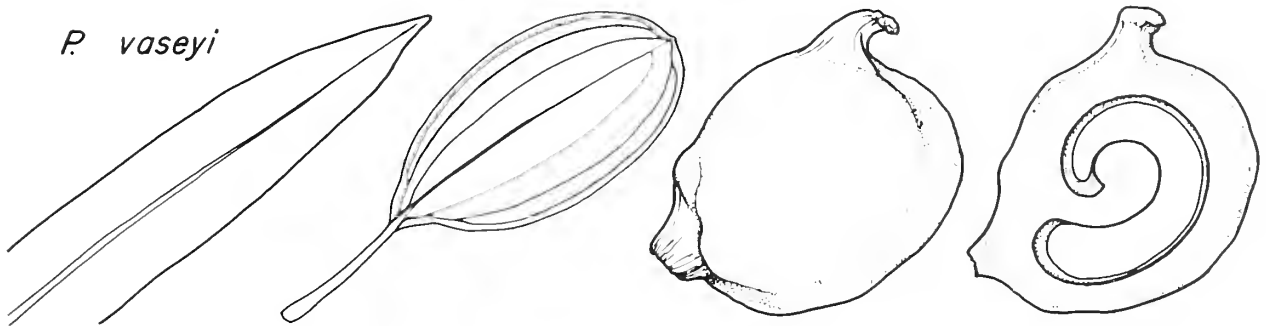


P. obtusifolius

14. *P. vaseyi* Robbins

Occasional. Quiet water of lakes.

Our only species with the combination of floating leaves less than 9 mm wide, linear submersed leaves less than 1 mm wide, and fruits with embryo coil less than 1 complete revolution. The similar *P. lateralis* Morong is thought not now to be in New York; it may be merely a variant of *P. vaseyi* or a hybrid with *P. vaseyi* being one of the parents.

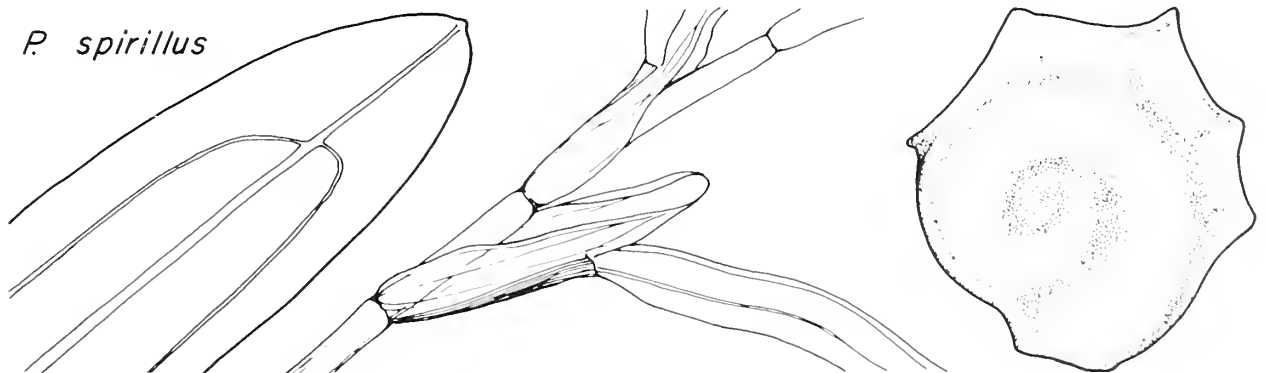


P. vaseyi

15. *P. spirillus* Tuckerman

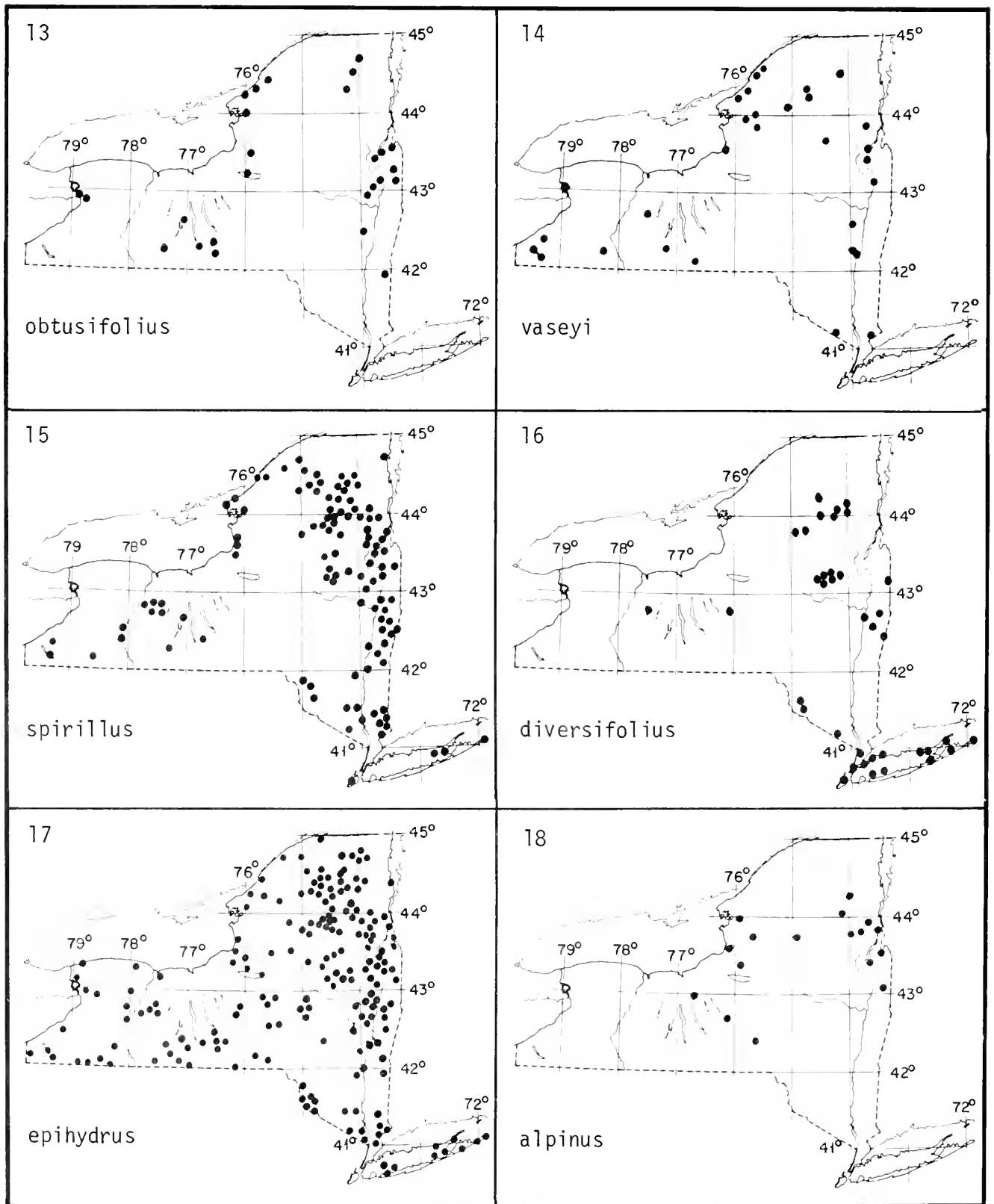
Common. Shallow pools, lake margins, and quiet streams.

Similar to *P. diversifolius*. These two species are recognized by their tiny fruits with walls so thin that the embryo coil is evident.



P. spirillus

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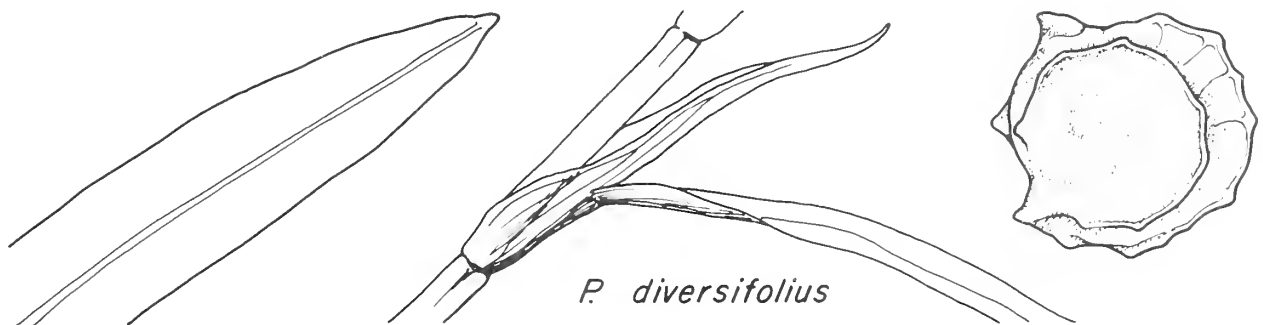


16. *P. diversifolius* Raf.

Not common, except in the Adirondacks and on Long Island. Pools, lakes, and slow streams.

Similar to *P. spirillus*. We have two varieties, which differ mainly by size: var. ***diversifolius*** and var. ***trichophyllus*** Morong (= *P. capillaceus*).

1. Submersed leaves 0.4-1.5 mm wide, subobtuse to acute; stipules 6-30 mm long; floating leaves with 5-15 veins, apex rounded; submersed peduncles 1-4 mm long var. *diversifolius*
1. Submersed leaves 0.1-0.6 mm wide, apex setaceous, stipules 3-12 mm long; floating leaves with 3-7 veins, apex acutish; submersed peduncles 3-13 mm long var. *trichophyllus*



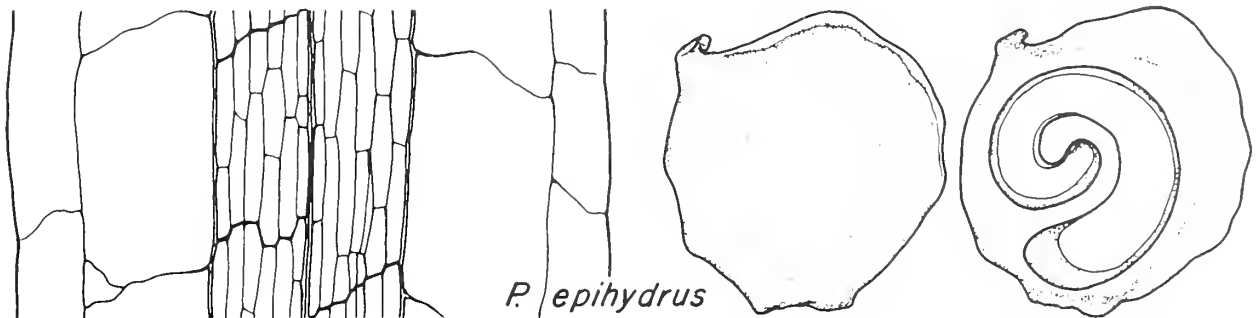
17. *P. epihydrus* Raf.

Common and often abundant. Pools, lakes, and streams.

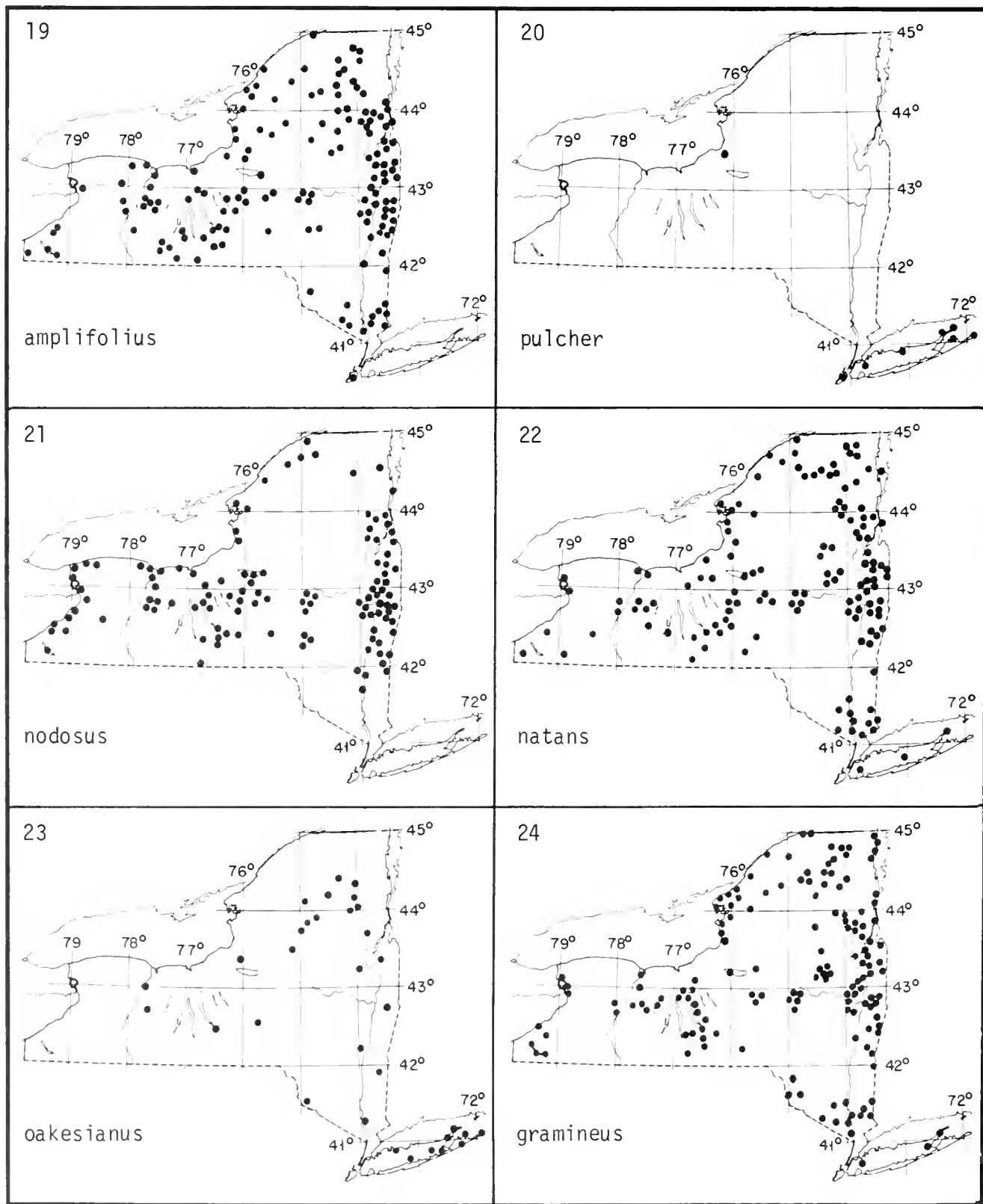
Easily recognized by the ribbonlike submersed leaves with a broad band of lacunae between the 2 veins closest to the midrib and by the large fruits with embryo coiled more than 1 complete revolution.

We have two intergrading varieties: var. ***epihydrus*** and var. ***ramosus*** (Peck) House (= var. *nuttallii*).

1. Submersed leaves 5-10 mm wide, with 7-13 veins; floating leaves 15-35 mm wide; fruits 3-4.5 mm long, 3-3.6 mm wide var. *epihydrus*
1. Submersed leaves 2-6 mm wide, with 5-7 veins; floating leaves 4-25 mm wide; fruits 2.5-3.5 mm long, 2-3 mm wide var. *ramosus*



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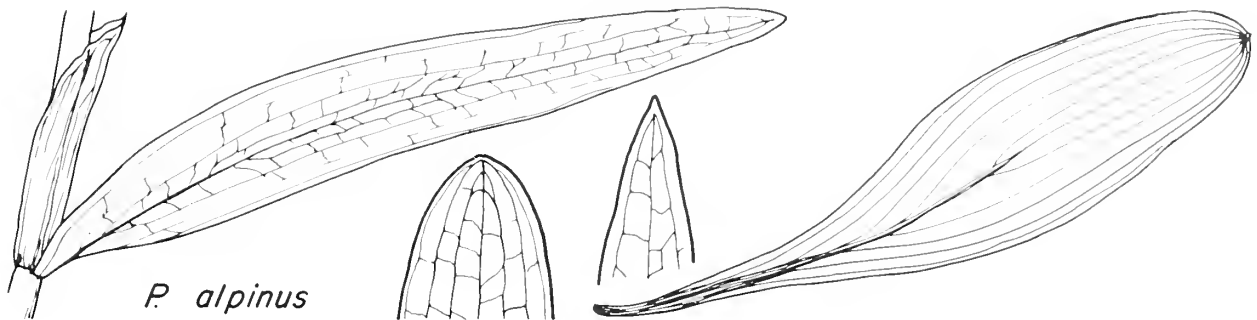
18. *P. alpinus* Balbis

Uncommon. Cold water of lakes and streams.

Easily recognized by the fruit, which is smooth, hard, and eggshell-like. With sterile specimens, clues are: sessile submersed leaves often with a reddish cast, and floating leaves that are delicate and with blades tapering gradually to the petiole.

We have two intergrading varieties which differ slightly from the European var. *alpinus*: var. *tenuifolius* (Raf.) Ogden, and var. *subellipticus* (Fernald) Ogden.

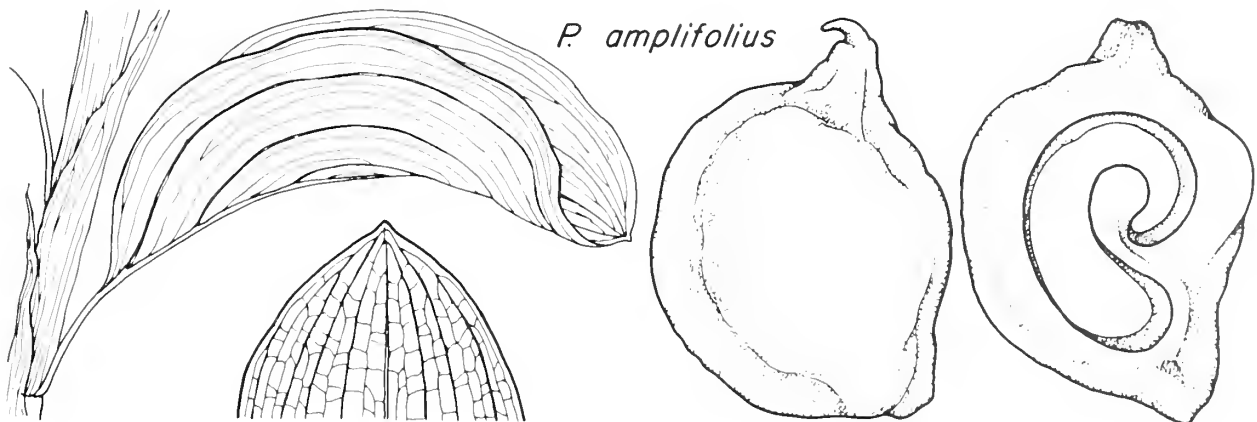
1. Submersed leaves oblong-linear to linear-lanceolate, 7-25 cm long, usually more than 8 times as long as wide, tapering to an obtuse or acutish apex var. *tenuifolius*
1. Submersed leaves oblong to ovate-oblong, 4-10 cm long, usually less than 8 times as long as wide, with a rounded apex var. *subellipticus*



19. *P. amplifolius* Tuckerman

Common and often abundant. Lakes and streams, usually in deep water.

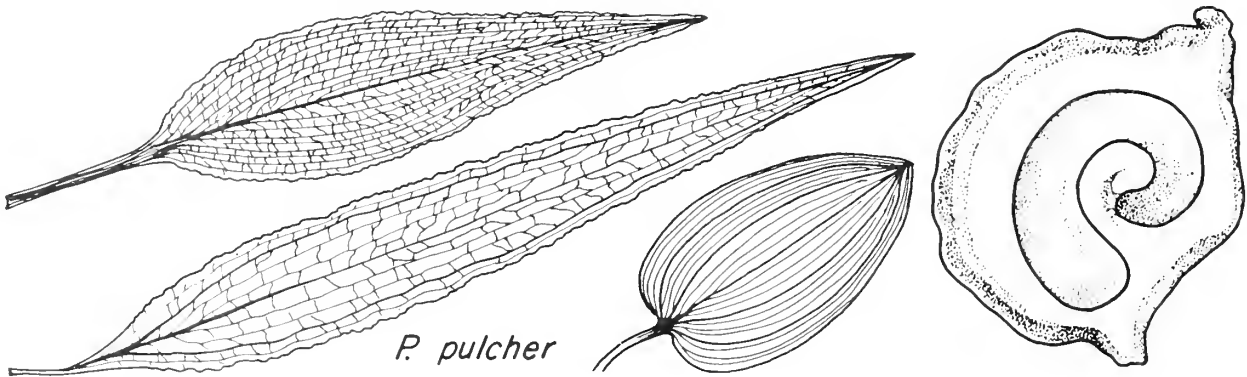
Usually recognized by its many large, arcuate, submersed leaves. It is sometimes confused with *P. pulcher*, *P. nodosus*, or *P. illinoensis*, but generally has many more veins in the submersed leaves (19-37) and in the floating leaves (29-51). From the highly variable *P. illinoensis*, it is separated by the submersed leaf apex: sharp in *P. illinoensis* and blunt in *P. amplifolius*.



20. *P. pulcher* Tuckerman

Rare or locally common. Shallow muddy pools and slow streams.

Our only species with cordate floating leaves and broad submersed leaves.



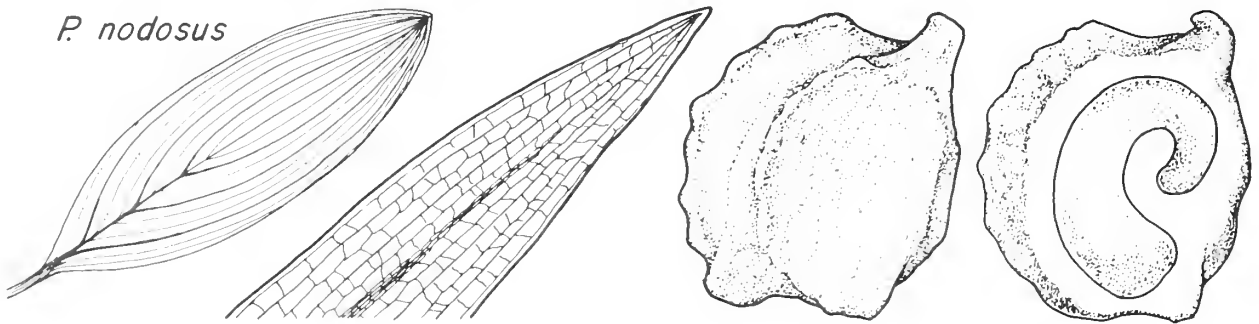
21. *P. nodosus* Poiret

Synonym: *P. lonchites*

Frequent to common. Lakes and streams.

A variable (in vegetative parts) species with floating leaf blades cuneate at base, submersed leaf blades narrowly lanceolate and tapering gradually to each end, and reddish fruits with strongly developed keels.

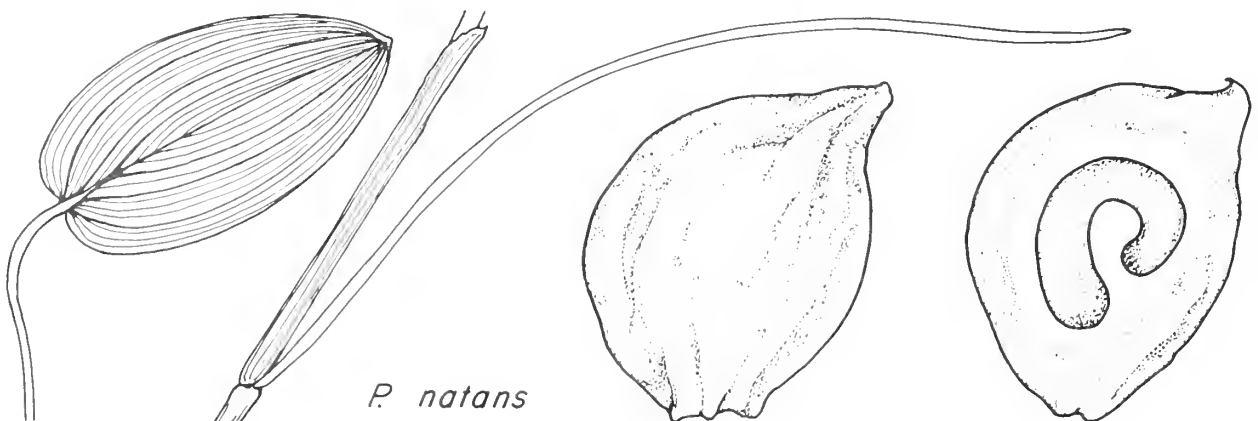
P. nodosus



22. *P. natans* L.

Common and often abundant. Lakes and streams.

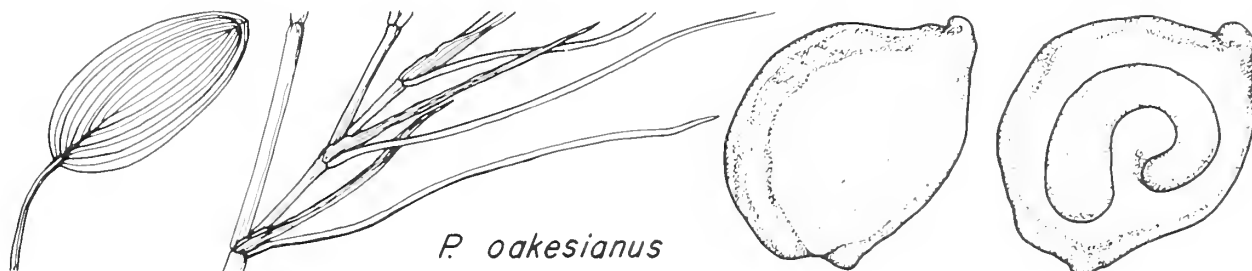
Plants with cordate floating leaves and narrowly linear submersed leaves. The latter decay early and are usually gone by the time the fruits appear.



23. *P. oakesianus* Robbins

Occasional. Ponds and slow streams.

Similar to *P. natans* but smaller. In North America some bog pool plants have floating leaves that are narrowly elliptic and as narrow as 5 mm, but these have not been found in New York.



24. *P. gramineus* L.

Common and often abundant. Lakes and streams.

A variable species with many compound branches bearing sessile lance-elliptic submersed leaves. Var. **gramineus** is the most common, but var. **maximus** Morong ex Bennet and var. **myriophyllus** Robbins occur in the State. It occasionally hybridizes with *P. illinoensis*, *P. perfoliatus*, and other species.

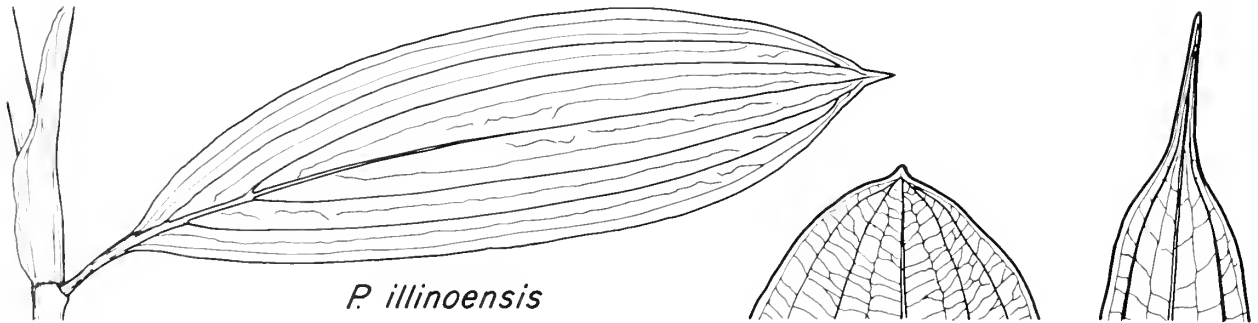
1. Submersed leaves narrowly elliptic to oblanceolate, mostly 2-10 mm wide, 5-10 times as long as wide, veins (3-) 5-9
2. Submersed leaves of the main stem mostly 15-50 mm long, 2-6 mm wide; veins 5-7 var. *gramineus*
2. Submersed leaves of the main stem mostly 60-100 mm long, 6-10 mm wide; veins 7-9 var. *maximus*
1. Submersed leaves linear, mostly 15-35 mm long, 1-2.5 mm wide, 10-20 times as long as wide; veins 3 var. *myriophyllus*



25. *P. illinoensis* Morong

Common and often abundant. Lakes and streams.

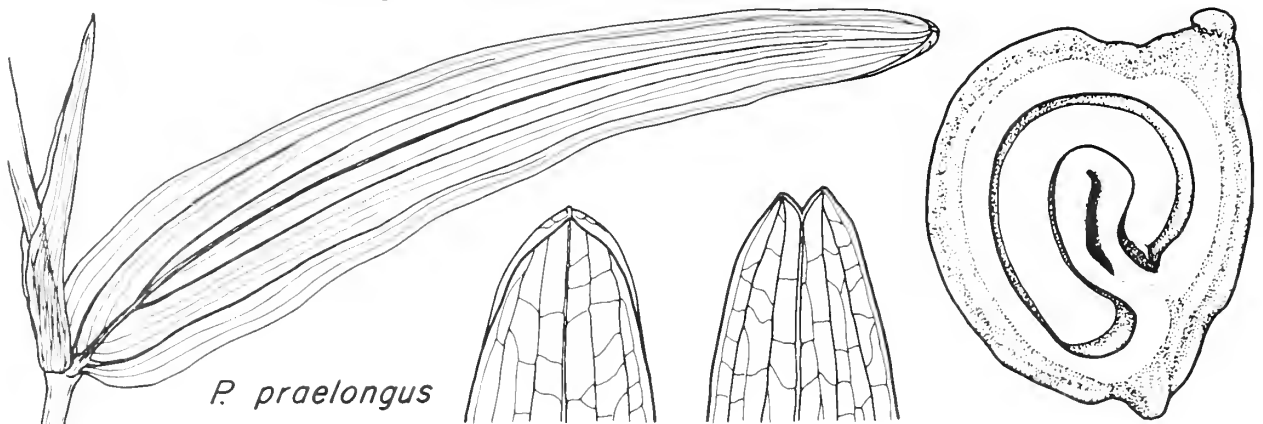
A highly variable species. It sometimes approaches *P. gramineus* (with which it hybridizes) but is coarser and less branched. From other species, it is usually distinguished by the sharp pointed, often mucronate, broad, submersed leaves. It is frequently found, even fruiting, with no floating leaves.



26. *P. praelongus* Wulfen

Occasional. Lakes and streams, usually in deep water.

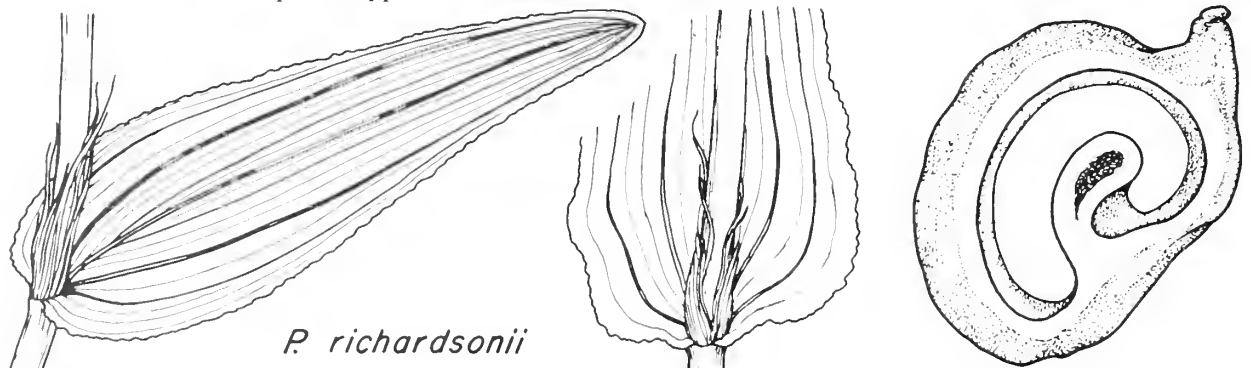
Plants with large, ovate-oblong leaves which are cucullate (boat-shaped) at the apex, whitish stem, large, conspicuous stipules, and long peduncles bearing large fruits. The fruits mature early (June) and sink, so are not seen late in the season. The cucullate leaf apex often splits when flattened.



27. *P. richardsonii* (Bennett) Rydberg

Common. Lakes and streams.

Similar to *P. perfoliatus*, from which it is distinguished by the cavity in the endocarp loop of the fruit and by the coarse whitish stipules. Sterile hybrids between these two species appear to be common.



28. *P. perfoliatus* L.

Common. Lakes and streams.

Ours is var. **bupleuroides** (Fernald) Farwell

Plants of brackish water have small ovate leaves but in fresh (especially acid) water the leaves are larger, more elongate, and may simulate those of *P. richardsonii*.

In the absence of fruits, the delicate fugaceous stipules yield the best character.

Sterile intermediates are common.



P. perfoliatus

POTAMOGETON



Excluded Species

P. lateralis Morong

Collected in Hemlock Lake, Livingston Co. in 1882; not seen since. Apparently closely related to *P. vaseyi*, it may be merely a variant of that species.

P. longiligulatus Fernald

This is probably a hybrid. *P. zosteriformis* is likely one of its parents; the other may be *P. strictifolius* or *P. hillii*. Collected in a few localities in the State. Also collected in Newfoundland, Connecticut, Ontario, Michigan, and Minnesota, but it had not been found in fruit until a single mature fruit was found in 1970 in Columbia Co., New York.

Hybrids

P. perfoliatus × *richardsonii*, *P. gramineus* × *illinoensis* and *P. gramineus* × *perfoliatus* are the most frequent hybrids seen in the State. The following have been reported for New York:

<i>alpinus</i> × <i>nodosus</i>	<i>gramineus</i> × <i>nodosus</i>
<i>amplifolius</i> × <i>praelongus</i>	<i>gramineus</i> × <i>perfoliatus</i>
<i>amplifolius</i> × <i>richardsonii</i>	<i>illinoensis</i> × <i>nodosus</i>
<i>epihydus</i> × <i>nodosus</i>	<i>illinoensis</i> × <i>perfoliatus</i>
<i>gramineus</i> × <i>illinoensis</i>	<i>perfoliatus</i> × <i>richardsonii</i>
<i>gramineus</i> × <i>natans</i>	<i>strictifolius</i> × <i>zosteriformis</i>

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